NAUE Combigrid® and Secugrid® reinforce the railway base course on damp, marshy ground.

The railway line between Berlin and Cottbus is being completely refurbished. The challenge: upgrade eight wet, boggy sections in the Spree Forest (Spreewald) between Königswusterhausen and Lübbenau to support train speeds of 160km/h. The solution: base course reinforcement with a combination of Combigrid® 40/40 Q1 151 GRK 3 and Secugrid® 40/40 Q1 geogrids. Since 2008, the German Railway Authority (Deutsche Bahn) has been reconstructing the major rail link between Berlin and Cottbus. Currently, the nearly 60-km-long section between Königswusterhausen and Lübbenau is being redeveloped, which means that train traffic along this stretch will probably be halted until April 2011. The work will be worth it.

Once reconstruction is complete, the new route will allow speeds of up to 160km/h, which will shorten the journey by approximately 20 minutes. Simple, but with high functionality. The wet-marshy subsoils of the Spreewald have presented a particular challenge to the project.

Site investigations confirmed that the base course would need to be built up through eight marshy sections on the rail line in order to support the new speed. Four design options were available, one of which involved a combination base reinforcement system utilizing both Combigrid® 40/40 Q1 151 GRK 3 and Secugrid® 40/40 Q1 geogrids. Important criteria for choosing a solution included:

- Costs
- Construction feasibility in terms of local conditions (e.g., water table, space constraints)
- Regulatory approval of both the project design and individual materials to be used.

The base layer is 50cm high and has two reinforced layers. The lower reinforcement is provided by Combigrid® 40/40 Q1 151 GRK 3, a geotextile-geogrid composite material with additional separation and filtration efficiency. The material's characteristics and application specification are in accordance with the Federal Railway Authority's (Eisenbahn-Bundesamt [EBA]) "Test Conditions for Geosynthetics in Approval Procedures of the EBA."

Above the Combigrid®, a reinforcement layer of Secugrid® 40/40 Q1 was installed along with another 25cm of cover soil. Secugrid® geogrids are also manufactured in accordance with the EBA’s guidelines. This use of Combigrid® 40/40 Q1 151 GRK 3 and Secugrid® 40/40 Q1 has been installed in all eight problem soil zones for base course reinforcement. Approximately 160,000m² of Combigrid® and Secugrid® have been installed along this important, refurbished rail line.

The use of durable geogrid reinforcement in the sub-base would provide the necessary permanent protection and stability where the non-cohesive soils have a high degree of overlap and/or are relatively thin. For the geogrid-reinforced base course, no special approval was required.
One of the main arteries running through Poland, the A1 motorway features a new section that has been constructed with the help of products from NAUE Geosynthetics. This new section, running between the Świerklany junction on the A1 and the Polish-Czech border in Gorzyczki, is built on land where much underground mining has taken place. The possible settlement of this land made it imperative that a suitable and reliable geogrid was selected for this project - a demand met by the Secugrid® range from NAUE. In total, some 200,000sqm of Secugrid® 100/100 Q6 has been selected, along with over 1 million sqm of Secugrid® 120/120 Q6.

These Secugrid® flat geogrids are made from interlaced extruded PET or PP polymer bars. The high strength monolithic welded junctions provide soil reinforcement for all civil engineering applications, including environmental, infrastructure and marine engineering projects. These geogrids offer superior soil reinforcement elements because they resist surface tensile force loading with very low elongation. This results in an immediate force connection and interlocking with the fill soil, without primary deformation.

Aperture size on both of the Secugrid® options selected is 28mm square, and elongation at nominal strength is no more than 6% in either direction. UV resistance is as high as 96.3%, and offer high weather resistance characteristics. Secugrid® is a lightweight but strong product. Secugrid® 100/100 Q6 has a mass of 800g/m², and a tensile strength of 100kN/m in both machine direction and cross machine direction. With Secugrid® 120/120 Q6 the mass is 875g/m², and the tensile strength is 139kN/m in either direction. One of the key advantages of using this material is that it can save natural mineral resources by reducing base course thickness - reducing the need for large volumes of stabilising soil fill, involved construction time, and transportation costs. The ability of Secugrid® to offer similar performance credentials to a PVA alternative also being considered, along with distinct price advantages, were other factors in the specification for this project. This section of the motorway is the third stage of construction - or the southern section - connecting the cities of Świerklany, Mszana, Godów and Gorzyce. Lead contractor is Alpine Mayreder Bau, with Alpine Bau Deutschland and Alpine stavební společnost acting as partner contractors.

As it passes through the Rybnik Plateau, the opportunity was taken to integrate the route into the local environment in 'an efficient and environmentally-friendly design'. However, the mining work of decades passed brought with it particular challenges, dictating that geogrids be employed and the adoption of alternative, stage-based gradeline solutions. The motorway's path takes in a variety of terrains, and has avoided city centres wherever possible (minimising the need for demolition work). It also passes through wastelands and arable land, as well as partly through forests.

Once again, NAUE products have shown their versatility and dependability in a project that represents a significant investment from Poland’s General Directorate for National Roads and Motorways. Drivers using this section of motorway will almost certainly be unaware of the legacy left by the mining industry in that country, but can be confident that the roads they drive along will remain stable and dependable.
Scout Moor Wind Farm is situated in the West Pennine Moors in Lancashire, northwest England. Like many wind farms, the space and weather conditions are ideal for harvesting wind power, but site access and establishing firm turbine footings is a challenge.

The 65MW, 26-turbine Scout Moor farm was constructed upon an extensive peat bog that is underlain by six coal seams and a number of abandoned, shallow mines. It was also anticipated that very soft to soft glacial clays would underlie a significant proportion of the blanket bog. Geological records indicate that the site is underlain by a total of six coal seams.

Limited records held by the Coal Authority indicate approximately thirty abandoned mine entries within the vicinity of the shallow cropping seams. It was anticipated that the vast majority of the site was underlain by extensive unrecorded shallow mine workings. Altogether 12km of roads were planned to ensure access. Germany-based geosynthetic consultant "BBG Bauberatung Geokunststoffe GmbH & Co. KG" carried out the design of the roads and 26 crane pad construction areas. A ‘floating road’ construction - essentially, a linear Load Transfer Platform proved to be the right solution, as it took into consideration the various site constraints as well as issues of constructability, design life and economics, all of which played a significant role in the final decisions.

The very low shear strength parameters of the subgrade, together with the potential collapse of mining voids in the area, required road reinforcement to prevent bearing failure. Geogrids were selected as the most suitable reinforcement material. They provided a relatively low cost solution when measured with constructability and ecological impact on the peat bog environment. The improved load-distribution behaviour of the geogrid-reinforced aggregate layers meant stress concentrations over the soft peat layers were reduced. This minimised differential settlements at the road surface. Also, it reduced the quantity of aggregate needed. In the United Kingdom, aggregate taxes can heavily affect project budgets, much in the way that suitable aggregate availability impacts project budgets elsewhere. For the 4.5m-wide access roads, two layers of 4.75m-wide Secugrid® were installed along the length of the road. This represented a significant time (and cost) savings over the original design, which had called for 4m-wide geogrids that would be installed across the road width. Secugrid® was identified as a technically equivalent and economically superior alternative; and the project was built within the scheduled time frame.

Approximately 500,000sqm of Secugrid® geogrids (tensile strengths from 30kN/m to 400kN/m) were used for the project.